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THE ETIOLOGY AND PATHOLOGY OF CHRONIC DEFORMING ARTHRITIS

AS FORECAST BY CLINICAL AND LABORATORY
OBSERVATIONS†

By JOHN V. BARROW AND EUGENE L. ARMSTRONG *

THIS paper will confine itself to the clinical expression, therapeutic sign-posts, and laboratory study of 245 cases of chronic arthritis of the deforming type. The deformity produced is in the nature of bone destruction, compensatory hypertrophy, and spastic irritation to all component joint structures. Exostoses, lipping, spurs and contractures are common factors in the disease under consideration. Specifically, this study does not deal with any of the acute septic arthritides as occasioned by the acute streptococcic tonsil, the gonococcal genitourinary tract, or any bacterial inflammatory focus.

The arthritic process in these cases seems to violate the known laws of bacterial infections. It does not seem to be of the inflammatory habit but it is rather in the nature of a toxic process having lytic, allergic, irritative and proliferative powers. The destruction is largely lytic in nature. The toxin or organism or substance is irritative and produces a marked effect on every tissue involved in the total structure of the joint. The proliferative exostoses

are probably compensatory or, at most, simply the result of stimulation in a destructive area, accompanied by a generalized capillary stasis.

The pathologic change produced in the total joint structure indicates that the etiologic factor has proceeded from the marrow or end-arterial tissue toward the periphery. The central bone injury indicates blood-borne factors, viz., toxins with lytic destructive powers, or some organism capable of elaborating lytic, destructive or irritative substances. Clinical and therapeutic observations combine with those of the laboratory in tracing the origin of this thing or substance more plausibly back to the gastrointestinal tract than to any other system in the human economy. Toward the support of the foregoing contentions this study is earnestly directed.

We are not to be construed as announcing a known and proved etiology of this form of chronic disease. We think we have observed correctly certain constants, which by the mathematical law of choice and chance tend to point to the joint pathology as an end product of an etiology established elsewhere. We believe the entire human organism as a system is affected and that the joint symptoms and changes are the most predominant and outstanding expression in this systemic disease.

The etiologic factor is not an acute one. Its first influence is on normal physiology, and its diabolical clinical and pathologic manifestations are first noticed necessarily months to years after the causative factors have been steadily or intermittently at work. The etiology will be found in a chain of factors much more complex than staphylococci in a boil, diplococci in the meninges, or even streptococci on the heart valves. This disease attacks the whole body by systems. Clinically, first to show physiologic changes and derangements is the gastrointestinal tract.

Two hundred and forty-five carefully studied cases are reported here. By the complaints of the patients, by the physical examination and by laboratory and roentgen-ray demonstrations, 235 of the cases, or 96 per cent, were definitely gastrointestinal cases first. They might well have been placed into a great "colon conscious" group. The foregoing factor is one of the first "constants" in the study of this disease. The literature abounds in the confirmation of this statement by practically all authors in their study of chronic deforming arthritis of Ely's¹ classification as type 2.

Table 1 shows the outstanding ailments accompanying the 245 arthritic cases studied here.

TABLE I—PRINCIPAL AILMENTS ACCOMPANYING
THE CASES OF ARTHRITIS

	Number	Per Cent
Chronic irrititis and arthritis.....	8	3.2
Chronic tonsillitis and arthritis.....	9	3.6
Chronic bronchitis and arthritis.....	10	4.0
Chronic hypertension and arthritis.....	12	4.8
Chronic cholecystitis and arthritis.....	23	9.3
Chronic colon stasis and arthritis.....	25	10.2
Chronic appendicitis and arthritis.....	35	14.2
Chronic "colon conscious" and arthritis..	235	96.0

The principal presenting symptoms are disturbances in the colon by quantities of gas, which pro-

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duces discomfort and pain and which interferes by pressure with all the abdominal visceral actions. Abdominal tenderness over the affected parts, loss of appetite and often sleeplessness are common symptoms. The following were the bowel habits observed: constipation in 50 per cent of all cases; diarrhea in 10.9 per cent; constipation and diarrhea alternating in 10.7 per cent; regular bowel habit in 28.4 per cent.

All the foregoing physiologic and pathologic disturbances came on slowly and reached their absorptive culmination at the patients' average age of 46.9 years. This age is another approach to a "constant." At such an age ample time has been given for the systemic absorption of retained residue and elaborated foreign proteins held in the mechanically injured and deranged gastrointestinal tract. The effect on the human organism is to be presumably good or bad according to whether the absorbed substance is metabolically good, a rejectable waste, or a combatable poison. In dealing either with waste or with poison, the functions of elimination and resistance are taxed, and if either function fails, some organ or system of organs must bear the burden. The reaction of our organism to proteins unsuited to our economy is somewhat known through anaphylaxis and allergy. The colon in particular and the remaining intestinal tract in general constitute the incubator, reservoir and distributor of the endoprotein bodies and by-products of the billions of protozoa that have found lodgment with us and that have succeeded in making out of our digestive tube their permanent home.

Their bodies are protein, each possessing its complete system. Every organism must possess its billions of protein molecules with characteristic resistance to us. These resistant proteins are logically toxic to us unless our own digestive mechanism can so change their chemical structure that their absorption is rendered harmless. Woe is ours, if our protective juices and detoxicating apparatus have been put out of order in this biologic fight. Absorptive toxic symptoms in these patients give us another "clinical constant" in this disease.

While seeming to have drifted from our subject, in considering the problem of the elaboration and absorption of protein bodies, possibly toxic to our own economy, we have prepared ourselves for the incidence of protozoan infection in those patients having chronic deforming arthritis. In other researches² we have emphasized the extremely high incidence of infection by protozoa in all cases of this type of joint disease. Recently, Smithies,³ writing on the subject of protozoa, says that our work has not been corroborated by others, while only a few paragraphs farther on, he himself, by a case report, corroborates them. This present research confirms our former ones. Kofoed has stated that his laboratory has made sixty-four analyses, in a single case, before finding the ameba. Our search has been by no means thus exhaustive. However, out of 245 cases we have 94 per cent positive for protozoan infection concomitant with chronic arthritis. There were only fifteen cases found negative, and certain of these with only the ordinary search permitted by noncooperating patients. Such a percentage of

positive results entitles us again to believe that we are dealing with "a constant" belonging to a biomathematical law.

Table 2 gives a reasonably accurate zoological classification of the protozoa found, with their incidence percentage in the 245 cases:

TABLE 2—PROTOZOA

	Number	Per Cent
<i>Ameba histolytica</i> or dysenteriae.....	135	56.0
<i>Chilomastix mesnili</i>	123	50.0
<i>Trichomonas intestinalis</i>	20	8.0
<i>Giardia</i> or <i>lamblia</i>	9	3.7
<i>Ameba coli</i>	6	2.4
<i>Ameba councilmannii</i>	5	2.3
<i>Craigia</i>	7	2.8
Mixed cases.....	69	28.0

The history of these patients was carefully obtained as to their arthritic involvements having followed some acute septic infection. In 93.5 per cent of the cases there was no history traceable to a previous acute infection. In thirteen cases, or 5.3 per cent, it began either during or fulminated within three months after an attack of influenza. It seems to have begun with acute tonsillitis and sinus disease in two cases, and with measles in one. In whatever stage of the disease, an attack of influenza or even the usual respiratory infections made the ailment worse.

The condition of the teeth and the tonsils was carefully noted. Eighty patients had had all their teeth extracted when they first presented themselves to us for treatment. Only two patients felt that this procedure had helped materially, and in none had it stopped the course of the disease. Ten came with bad teeth, and 158 showed teeth in good condition. The records for tonsil extirpation are not flattering. One hundred and forty-eight, or 60 per cent, had had their tonsils removed, and only one of the number felt that the disease had been checked by the operation. Seventy-five patients had normal tonsils, and eighteen showed a diseased condition. Septic foci in tonsils and teeth were neither left nor condoned, but their removal made no monumental difference in the progress of the disease, either prior to or during our treatment.

The injury to the intestine was seen in the cases in which operation was done for the restoration of normal physiologic function. The ulcers were seen producing their dire mechanical blocks in all stages. Protozoan ulceration and invasion give very little peritoneal or localized pain. An ulcer may be protected from rupture by the thinnest one-celled veil of serosa. Over this point, as a vulcanizing patch, nature throws out a quantity of fibrinous deposit. The next step for protection is the organization of this patch by the penetration of fine capillaries. The end product is a membrane with all the possibilities of contracting sheets and bands. The resulting deformity varies in its effect by reason of its position and extent. The ileocecal juncture, cecum, hepatic flexure and sigmoid flexure are probably the areas most often harmed. The colon may be rolled, twisted, kinked or practically cut off by this mechanism. The appendix may be kinked, occluded, tied to some other viscus or may have its circulation so shut off that gangrene, perforation and peritonitis may result. If this is protozoan the process will be

insidious, with a minimal amount of pain and classic signs. The leukocytes will not be high, and the polymorphonuclears will be depressed. The same picture will obtain if a viscus perforates in any part of the intestine. Near perforation with its subsequent adhesions may furnish the bad mechanics that give the ideal protozoan incubator. What greater source for endotoxins could be provided than by such an injured intestine? Here is the source of the Jackson's veils and the embryonic shortcomings of our abdominal viscera. This pathologic condition may and often does begin in early childhood. It is expressed clinically by cramps, reversed peristalsis, stasis, constipation and diarrhea, lack of fluid absorption with its attendant "acidosis," interference with appetite, and an early "colon conscious" individual. Trace this from early life to the age of 45, and one can readily understand the great number of clinical derelicts encountered in middle life invalids. One can also readily see why proper surgical correction in these cases is so prolific of real benefit in health restoration.

Such a colon incubator contains within its mucous membrane and walls, and in its lumen, literally billions of these relatively large protein-molecule protozoa. Kofoed has shown that their growth is in showers. Either their own excretory products or our resisting antibodies kill these organisms in showers as they have grown. This biologic cycle explains well the fulmination of clinical symptoms. When great numbers are killed by treatment the joints become worse clinically in the same manner that hyperthyroidism becomes exaggerated on excessive manipulation of the gland.

As treatment succeeds in clearing the colon, there is a commensurate amelioration of all symptoms. However, because of the chronically produced pathologic condition, we must often wait for months to two or three years for the best and proper results of treatment.

Symptomatically these patients are often greatly depressed and highly nervous. The metabolic processes seem to have become more or less exhausted. There is a low blood pressure generally, and lassitude goes with muscle exhaustion. Around the affected joints the muscle and tendon spasm expresses the metabolic strain, not greatly unlike the exhaustion of tissue in such diseases as pernicious anemia. The very choicest gastrointestinal clinics are obtainable from these patients in the orthopedic wards of our hospitals. The acme of this mechanical and absorptive pathologic process is reached at about the age of 45 years. The physical examination corroborates this muscle tiredness, intestinal tenderness, gassy abdomen, glandular exhaustion, low blood pressure, iritis,⁴ neuritis, arthritis and still other products of these numerous factors.

The laboratory is a further confirmation. The liver strain is expressed by a rise in the icterus index, as shown by an average of 9.5 in the 128 cases measured. The hemoglobin was fair at an average of 75 per cent. There was little high grade anemia. The red blood cells averaged 4,207,000, and there were none of the exhaustive forms as in the hyperplastic anemias. The leukocytes were depressed to an average of 6827 in the 245 cases. There were

seventy cases out of the 245 in which the leukocytes were 6000 or below, and thirty-one cases in which the count was below 5000. These figures are really too high, because a goodly number were taken during colds and acute bronchial conditions. This depression is probably greatest in the polymorphonuclear neutrophil cell.

The polymorphonuclears alone averaged 60.2 per cent. There were fifty-eight cases in which the polymorphonuclears averaged 55 per cent, and in thirty-three cases the average was below 50 per cent. There was no eosinophilia, even to the suspicion of a rule, in these protozoan laden cases, as has been recently reported.² The urine often shows indican, but no other significant bodies. The stool often contains a fine, needle-like crystal. It is not a coffin-lid crystal. It is probably a calcium soap.

These crystals exist singly and in clusters, and appear quite insoluble in the watery content of the bowel. If this is an insoluble fatty combination with calcium, we can the better account for the calcium poverty of these cases. We are hereby furnished the connecting link between chronic arthritis and certain metabolic deficiency diseases.

These stools have a specific gravity heavier than normal, and usually sink readily in water.

It is probable that this phenomenon is accounted for by the lack of bacterial gas producers. Kofoed has recently shown that the hydrogen ion concentration influences protozoan growth markedly.

In eighty cases the phenolsulphonphthalein kidney function test averaged 53.1. The nonprotein nitrogen in fifty-one cases was 33.1. The blood sugar in the cases read was 104.2. This does not include the one case of diabetes in the series.

The joints attacked in the order of their frequency were fingers and hands, knees, neck and spine, ankles, hips, elbows, shoulders, wrists, sacroiliac, feet and toes. None seemed to be specially selected and often the disease was generalized.

The treatment necessarily calls for our best and broadest clinical judgment, for it must embrace practically every phase of the gastrointestinal tract. It comprises every angle in the parasitic management from the earliest to the most delayed chronic injury. It may be grouped under (1) parasitic, (2) physiologic, (3) corrective, and (4) recuperative. Under parasitic treatment we must determine whether the infection is relatively recent or definitely chronic; whether ulcers or adhesive bands have deranged the function; whether the generalized inflammation has produced a dysentery or obstructing bands have produced injurious stasis. If the invasion is acute and extensive there is probably dysentery to combat. If it is slow and adhesion forming, a stubborn constipation is the problem. If pocketing and stasis have been produced in such a way as to encourage great growth and subsequent dissolution of organisms, the endotoxic factor with its absorptive, allergic problems are involved. The latter factors are probably most concerned in the matter of neuritis, iritis, arthritis, the anemias, and kindred clinical expressions.

These problems are far too numerous and prolific for the scope of this paper. We shall dwell chiefly on the ones we consider of greatest value to

the clinician, viz., parasitic and physiologic. Under the former we place all efforts at killing the parasites or removing them from the body where their harmfulness to us is nil. Under the second, or physiologic, we shall discuss the means of correcting faulty mechanics and restoring normal function.

Of the parasitocides used there is not one specific. Ipecac, its alkaloid, emetin, and its salts, emetin-bismuth iodide, and the periodide are the most useful in these infections and by far the most helpful in all arthritic cases. The treatment is usually begun with emetin hydrochloride, one-third grain (0.02 Gm.) by deep hypodermic injection on alternate days. If the case is severe the injection is given daily. After the third injection the dose is given intravenously. This treatment is kept up regularly for about three weeks, when the interval of doses is increased to twice weekly for another two or three weeks; then a weekly dosage is used for a period of a month or two. If muscular weakness develops in the course of treatment the drug is discontinued for whatever period is required by the patient's strength and resistance. Usually as a safeguard against muscle tiredness we give weekly or biweekly intravenous injections of the tricacodylates of iron. This has a wonderfully tonic effect.

Often coincident with the emetine treatment, or entirely in place of it, the patient is given massive doses of salol-keratin coated (5 grain, 0.3 Gm.) ipecac pills. Usually six 5-grain pills are given at 1 o'clock in the morning. Everything should be arranged for the patient's comfort and the provocation of sleep, following this administration. An ice bag is applied to the epigastrium and the patient is requested to rest quietly on the right side. Each night this dose is increased by two pills, until the maximum dose of twelve pills is given. If fairly well tolerated the dose is then stepped down nightly by two pills, until two per night is reached. The nurse must be watchful that the pills do not pass through the bowel undissolved. However, the central effect of ipecac is usually definite enough to tell the physician that absorption of emetin has taken place. Sometimes an opiate is given to prevent nausea, but often this drug defeats the very purpose for which it is given.

At times the duodenal tube is passed, and when it has reached its home we introduce from one-half to 1 drachm (2 to 4 cc.) of the fluidextract of ipecac, mixed with 4 ounces (120 cc.) of salt solution. This solution is further washed in with a few more ounces of salt solution. The treatment is a rather heroic one, but has a good effect in stubborn cases. The same method is used with neoarsphenamine, 0.75 Gm. being given in 6 ounces (175 cc.) of salt solution for both amebiasis and giardiasis. We repeat the dose about every fourth or fifth day for from three to five doses.

The next form of ipecac frequently used is the emetin bismuth iodide. This is generally given in a 3-grain salol-keratin coated capsule at midnight, with the same technique used as for the ipecac pills. From six to ten nightly doses are often more than can be tolerated. We never hesitate to discontinue temporarily any treatment that is not well borne. When any muscle tiredness or weakness indicates

emetin saturation the drug should be completely withdrawn until all lassitude subsides. We hear much about the depressing action of emetin on heart muscle. We regard this danger as having been highly exaggerated. The authors' cardiographic reading, after emetin was taken, was better than before its administration. Further research on this subject is in progress.

We must not leave ipecac without giving a combination used by the authors almost routinely from the first because of its splendid laxative action in the constipation cases. It consists of a capsule of calcium phosphate, 4 grains (0.25 Gm.) and alcresta ipecac, 6 grains (0.4 Gm.). This dosage, three times a day before meals, is a wonderful adjunct as a chronic treatment in these cases of constipation. For convenience we have called it "Calcresta." It may be obtained in capsule combination from the pharmaceutical house. It is worth many times its weight in spinach, and if used chronically will relieve and cure many cases of constipation and coincidentally furnish a most excellent liver stimulation.

Arsenic is the second greatest parasitic weapon. Neoarsphenamine in varying dosage both by duodenal tube and by usual intravenous administration is generally helpful. Kofoed has recently shown this drug to be highly lethal to protozoa in vitro at about 1:145,000.

The foregoing is probably the most powerful parasiticide in our possession. Our method of administration is that which is familiar to every physician. Recently stovarsol has come in for much praise by oral administration. In the acute colitis cases we have found it of considerable help. Patients having stasis or hepatitis get an early and embarrassing arsenical saturation. The dermatitis readily yields to sodium thiosulphate intravenously and by mouth, and probably no harm is wrought; but we regard the drug as bearing a high degree of watching in its administration. Johns and Jamison⁵ have recently reported favorably on this drug in acute cases. Other remedies, as chaparra amargosa, sulphur, and bismuth, are used at times. Enemas of potassium permanganate, 1:5,000, are efficacious. De Rivas⁶ has used the thermal death-point of 47 C. in colonic and duodenal lavage to good advantage. Every effort is made to restore the normal bowel function. When the roentgen ray has demonstrated ileal stasis, cecal retention, and long continued colon delay, we realize the futility of drugs alone, and then call for corrective surgery. If the roentgen-ray study shows a delay of from five to ten hours in the ileum after the stomach has emptied; if squarely segmented barium masses remain for days in a clubbed adherent or kinked appendix (we recently observed one for twenty days), or if there is a pocketed, adherent cecum with days of stasis, or if there is other physiologic evidence that mechanical injury to the normal intestinal action—eliminative or absorptive—has been wrought, then this case requires corrective surgery. When normal function has thus been established the routine medical management must be pursued as the clinical condition demands. Orthopedic help is of little value, if we are to permit the injurious process to go unimpeded. Orthopedic treatment must necessarily fail if it makes no

attempt to stop the cause of the deforming pathologic condition. The medical management detailed above does not in any way militate against orthopedic management. However, the proper understanding of the other faulty clinics of the patient may modify the application of exercises, rest and other physiotherapeutic measures. Knowledge of these conditions may solve some of the complications of fractures. In the light of this presupposed etiology some of the long chronic accident cases which have resulted from trivial injuries are well explained. The therapeutic test will complete the proof in the percentage of cases high enough to satisfy any faithful, observing and conscientious clinician.

Before giving the results of the treatment in this series of cases, we desire to call attention to the delayed results in this, the most chronic of diseases. Both patient and physician must learn "to labor and to wait." The clinical relief may be weeks, months or even a year or two in manifesting itself. We have had patients under months of faithful and to us nerve exhausting treatment without much to encourage us in the way of relief. They have been sent away for a period of rest and have returned months later greatly improved and bearing the enlightening information that their improvement or cure was due to prayers, orange juice, or some simple change of routine life.

This experience has occurred often enough to make us certain of the therapeutic value of the treatment we have carried out. We have turned this experience into good clinical account, and by passing it on to our patients and other physicians we believe we have turned their aim from the decoy to the real game in question.

Dietary treatment has failed to yield any measurable results. We cannot agree with Pemberton⁷ that the glucose tolerance of the blood bears any definite relation to either etiology or treatment of this type of arthritis. Schmitt and Adams⁸ of the Mayo Clinic arrived at the same conclusion.

Of our total group of cases 171 received only medical management. Parasitic treatment played the leading rôle, but in no case have we denied our patients any clinical aid calculated to enhance normal function. We therefore utilized surgery in 15.5 per cent of the cases.

The end products of treatment are hard to estimate, because no two patients ever were the same clinically from any disease to which the human organism was ever heir. We have tried to evaluate results as follows:

1. Excellent has meant well-established improvement conceded by patient, friends, neighbors and, most important, by other physicians. Some of these cases might well be termed spectacular.

2. Good covers all those cases in which pain has ceased, health improved, joints more usable, and the "carry on" feeling has begun to return to normal.

3. Fair embraces those cases in which we can see some definite clinical improvement, but in whom there is still much to be desired.

4. The fourth group includes those in whom there was no benefit at all clinically and death or down-

ward progress of the clinical course was self-evident. There were fourteen of this group. Four died from intercurrent pneumonia of pneumococcal origin, and one died from true angina pectoris. We had thirty-six cases which we felt could fairly be classed as wholly inadequately treated.

Our series of fairly treated cases is 209. Of this number we were able to classify sixty-four, or 30.6 per cent, in the group of excellent results. On the basis of the entire series of 245, this percentage is 26.1. In the group of good results there were eighty-eight, or 42.2 per cent of the well treated and 35.9 per cent of the entire series. In the group of fair results there were forty-three, or 20.5 per cent of the well treated or 17.5 per cent of the entire series. We are thus certain of clinical benefit in 93 per cent of the cases treated or of 77 per cent in the entire group seen. We realize that this series is very small and that the time limit for end products is by no means in sight. However, the clinical results to us and our patients have been as a rule so gratifying that we do not hesitate to venture this forecast and place it into the hands of careful clinical investigators for both use and criticism. For usefulness to you and your patients we can recommend it most highly in a disease for which we have heretofore done but little. For criticism without personal knowledge or investigation, we are certain it will prove a wonderful stimulus to you. For your approval after your honest trial and investigation, we are willing to rest our case.

In conclusion, we wish to cite the tendency of the clinical factors to approach mathematical constants in our study of the foregoing cases of deforming arthritis. To be more explicit, these factors may be specifically enumerated for further observation and criticism as follows:

1. This type of bone and joint disease is not of the inflammatory type, as we are accustomed to see from bacterial invasion.

2. The disease is of a systemic nature as taken from its metabolic exhaustive syndrome, as might well be expressed from slow stimulation, followed by exhaustion.

3. There is evidence in the liver and bone marrow that endotoxin, chemical bodies, or even organisms themselves, originate in the intestinal tract, and, by this same capillary stasis, lodge, influence and produce this condition in bones and joints.

4. This contention is further supported by the exhausted vitality, "colon consciousness," digestive unrest and often deranged intestinal mechanics.

5. There is a depression in the action of the bone marrow activity, as shown by a tendency to leukopenia and polymorphonuclear poverty.

6. The stool shows fatty-like (calcium) crystals and an infection by protozoa in a percentage far beyond coincidence and easily approaching a mathematical law.

7. The therapeutic proof forecasts this protozoan etiology in a highly satisfactory manner, and in at least two cases the pathologic condition has been shown by the finding⁹ of the organisms in the diseased bone tissue.

8. Negatively, but none the less constant, is the

failure of the removal of teeth, tonsils, and well-established bacterial foci, to stop the pathologic and clinical course of the disease.

(Manuscript written by J. V. B.)

REFERENCES CITED

1. Ely, Leonard: Second Great Type of Chronic Arthritis, J. A. M. A., November 24, 1923.
2. Barrow, J. V.: A Clinical Study of Intestinal Protozoa Based on Seven Hundred and Twenty-Five Cases, Am. J. Trop. Med. 4, No. 1, January, 1924. Barrow, J. V., and Armstrong, E. L.: Intestinal Protozoa and Chronic Diseases, with Especial Reference to Chronic Arthritis, J. Iowa State M. Soc., October, 1925; Intestinal Protozoa and Chronic Diseases, with Especial Reference to Chronic Arthritis, Illinois M. J., June, 1925.
3. Smithies, Frank: Protozoiasis Occurring in Temperate Zone Residents: A Study of Two Hundred and Sixty-Five Instances with a Discussion of the Associated Digestive Malfuction, Am. J. Trop. Med. 6, January, 1926.
4. Mills, Lloyd: Amebic Iritis Occurring in the Course of Nondysenteric Amebiasis, Arch. Ophth. 52, No. 6, 1923.
5. Johns, F. M., and Jamison, S. C.: The Treatment of Amebiasis by Oral Administration of Stovarsol, J. A. M. A. 84: 1913, June 20, 1925.
6. De Rivas, D.: The Effect of Temperature on Protozoa and Metazoan Parasites and the Application of Intraintestinal Thermal Therapy in Parasites and Other Affections of the Intestine, Am. J. Trop. Med. 6, January, 1926.
7. Pemberton, Ralph; Cajori, F. A., and Crouter, C. Y.: Influence of Focal Infection and the Pathology of Arthritis: Results of Experiments, J. A. M. A., December 5, 1925.
8. Schmitt, O. G., and Adams, S. F.: The Association Between Diabetes Mellitus and Chronic Infectious Arthritis, J. A. M. A., February 20, 1926.
9. Kofoed, C. A.; Ely, Leonard, et al.: The Ameba as the Cause of the Second Great Type of Arthritis, California State M. J., February, 1922.

Whose job is health education? asks Merrill Champion (Publications, Massachusetts Public Health Department), who answers in part:

"When you come to think of it, the success of public health work of every kind depends upon health education. Even the abatement of nuisances is truly successful only if the offender and the public are educated to a higher standard for the future. In this sense, then, everyone engaged in public health work is to a greater or less extent a health educator. It is worth while to enumerate some of those who may with reason be included in the ranks of those teaching health. The health officer surely belongs there as does the public health nurse. The nutritionist, the dental hygienist, the physical educator, the health visitor, the visiting teacher, the right sort of social worker, the physician and the dentist, belong too in the front rank if they can get away from obsessions engendered by previous exclusive attention to pathology. Then, of course, there is the school-teacher, general or special. Lastly, and potentially most important of all, there are the parents.

"This makes a long list. It raises the question whether, with so many sharing the responsibility, failure is likely because of lack of concentration. This criticism would hold good if health education were strictly a matter of the conscious application of approved pedagogical principles. As a matter of fact, however, this is not so. The list of health habits that we can be reasonably sure of is relatively a short one. Probably at least some of the things we have stressed so confidently and dogmatically in the past have only a remote bearing upon health."

What history we have of man is largely a record of discontent. In the main, man's activities are but reactions to his discontent. If and when he becomes contented, he usually goes to sleep. The greatest urge to accomplishment is dissatisfaction with things as they are.—*Canad. M. A. J.*

THE OUTLOOK FOR THE DIABETIC

By ELLIOTT P. JOSLIN

New England Deaconess Hospital, Boston

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Classification of Supposed Diabetics—With the help of my student friends, Mr. Alexander Marble and Mr. Richard Middleton of the fourth year class of the Harvard Medical School, I have spent spare summer evenings in personally recording the classification of each one of the diabetics I have seen since 1898. Classification of the diabetic is still puzzling and in fact is quite as difficult as it was years ago. Despite the aid of tests for blood sugar one runs across a great many patients who have lived so long that the disease appears "burned out," and about the only remains of it one finds are the calcified arteries which represent the ashes. An infection will make these latent cases apparent. Then, too, there is another group who evidently have never been severe, very likely were educated in the tenets of the Allen School, originally were fasted for a day or two, and have held to a Spartan régime ever since. These patients usually have a urine which is sugar-free and before a meal the blood sugar is almost normal, and not a few of them show a normal blood sugar following a meal. One hesitates to give a liberal carbohydrate meal, much less a glucose tolerance test, to these "faithful" merely to gratify a classification whim. Then there is the group of patients in whom the disease was diagnosed very, very early, by reliable physicians, was probably unmistakably present, yet actual proof of it is wanting now. Thus a vivacious Miss, whose glycosuria was 1.7 per cent in my own laboratory when I first saw her in 1919 and later decreased to the merest trace with diet, came to my office this month. When her diabetes was detected in 1917 by the late Doctor Koplik, whose name we all recognize, he kept her out of school for a year and the sugar fell to a mere trace. For the following four years she was on a rigid diet, but now before lunch the blood sugar is 0.10 per cent, and one hour after a characteristic boarding school girl's lunch of a chicken salad sandwich, hot chocolate, ice cream with fudge marshmallow, it rose to but 0.12 per cent. Is she, was she a diabetic or a renal glycosuric? These baffling situations arise in selecting the group of true diabetics. After all is said and done, can it be that in the past we have builded better than we knew? Is it not possible that diabetes may "burn out" in the young, as well as in the old, if we allow the element of time to work?

TABLE 6

True Diabetics—Time and death are great classifiers, and Table 6 shows this very plainly. The first 1000 supposed diabetics coming for treatment contained 906 true diabetics, but this number has decreased in succeeding thousands so that in the fifth at this writing the true diabetics number 809. As time goes on undoubtedly there will be transfers to the true diabetic group from the other groups, particularly the "unclassified" group. I do not think the group of true diabetics will ever grow as large in the fifth thousand as it was in the first, because